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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/044,864	10/22/2001	Vladimir Zubkov	01-569/LSI1P177	9835
24319	7590	12/22/2003	EXAMINER	
LSI LOGIC CORPORATION			ERDEM, FAZLI	
1621 BARBER LANE			ART UNIT	
MS: D-106 LEGAL			PAPER NUMBER	
MILPITAS, CA 95035			2826	

DATE MAILED: 12/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b> 10/044,864	<b>Applicant(s)</b> ZUBKOV ET AL.	
	<b>Examiner</b> Fazli Erdem	<b>Art Unit</b> 2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 22 September 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3, 8, 13, 14 and 16-20 is/are rejected.
- 7) ☒ Claim(s) 4-7, 9-12 and 15 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All   b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                  | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____  |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)         | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Allowable Subject Matter***

1. Claim 4-7, 9-12 and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 8, 13,14, 16, 17, 18-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao et al. (6,261,963) in view of Swanson (3,710,205) further in view of Carlson et al. (3,632,438) further in view of Stumborg et al. (6,211,066). Regarding Claim 1, Fig. 3 of Zhao et al. shows dielectric layer 120, copper layer 140 and barrier layer 325A. Zhao et al. disclose this barrier layer to be one of titanium nitride, titanium tungsten, nitrided titanium-tungsten, magnesium, or another suitable barrier material. Note column 5. Zhao et al. do not show this barrier layer to be an oxide layer doped with one of magnesium, calcium, strontium, beryllium, or barium. However, Swanson discloses an electronic components having improved ionic stability where the required silicon oxide doped with divalent ions is disclosed.

Regarding Claims 2, 3, 17, 19 and 20 Swanson shows silicon oxide doped with divalent ions.

Art Unit: 2826

Regarding Claims 8 and 13 Figs. 3-10 show multiple layers of copper interconnect structure with multiple layers of dielectric and barrier.

Regarding Claims 14, 16 and 18, Columns 8-12 show the method of making a copper interconnect with multiple layers.

Zhao et al. and Swanson combination do not disclose the required ion dopant structure and the barrier layer structure. However, Carlson et al. disclose a method for increasing the stability of semiconductor devices where the required dopant structure is disclosed. Furthermore, Stumborg et al. disclose electronic devices with barium barrier film and process for making same where the required barrier layer structure is disclosed.

It would have been obvious to one of having ordinary skill in the art at the time the invention was made to have the required dopant structure and the barrier layer structure in Zhao et al. and Swanson combination as taught by Carlson et al. and Stumborg et al. respectively in order to have a semiconductor device with better stability.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fazli Erdem whose telephone number is (703) 305-3868. The examiner can normally be reached on M - F 8:00 - 5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (703) 308-6601. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Application/Control Number: 10/044,864

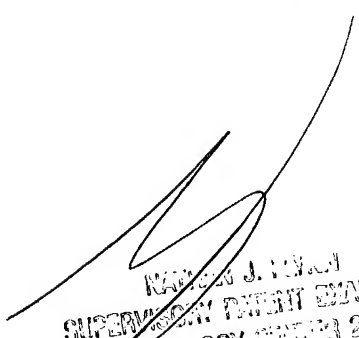
Page 4

Art Unit: 2826

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

FE

December 15, 2003



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